CLAIMS:

1. Optical apparatus comprising an optical system (6, 7) for providing a coherent radiation beam (2), a strongly scattering object (5) located in the path of said coherent radiation, and a pixelated photo-detector (6) for detecting a speckle pattern incident thereon, said speckle pattern being produced by said coherent radiation being incident on said strongly scattering object (5), wherein the size of the pixels of said photo-detector (6) is determined by the location thereof in said optical apparatus relative to said strongly scattering object (5) and is set at substantially the same size as that of bright and dark patches present in said speckle pattern as determined by λ/NA, where λ is the wavelength of said coherent radiation, and NA is the numerical aperture of said optical system (6, 7).

2. Optical apparatus according to claim 1, wherein the optical system comprises a coherent radiation source (1) for providing a coherent radiation beam (2) of radius a, said photo-detector (6) being located a distance z from said strongly scattering object (5), wherein NA=a/z.

3. Optical apparatus according to claim 1, wherein the optical system comprises a coherent radiation source (1) for providing a coherent radiation beam (2) of radius a, and one or more converging optical elements (7) having a focal length f, in the path of the coherent radiation beam (2) between said strongly scattering object (5) and said photo-detector (6), wherein NA=a/f.

4. Optical apparatus according to claim 3, wherein the one or more optical elements (7) are located a distance v from the strongly scattering object (5) and a distance b from the photo-detector (6), wherein $1/v + 1/b = 1/f$.

5. Optical apparatus according to any one of claims 1 to 4, wherein a spatial light modulator (4) is provided between the coherent radiation source (1) and the strongly scattering object (5).

6. Optical apparatus according to any one of claims 1 to 5, wherein one or more elements (3) with optical power is provided in the radiation path between the coherent radiation source (1) and the strongly scattering object (5).

7. Optical apparatus according to any one of claims 1 to 6, wherein the formation of a speckle pattern by said strongly scattering object is an implementation of a physically unclonable function.

8. Optical apparatus according to any one of claims 1 to 7, wherein the photo-detector (6) and the strongly scattering object (5) are located relative to each other such that the pixels of the photo-detector (6) are at least smaller than $\eta_{max}\lambda/NA$, where η_{max} is a number in the range 1 to 20.

9. Optical apparatus according to claim 8, wherein η_{max} is a number in the range 1 to 10.

10. Optical apparatus according to claim 9, wherein η_{max} is a number in the range 5 to 10.

11. Optical apparatus according to claim 10, wherein $\eta_{max} = 5$.

12. Optical apparatus according to any one of claims 1 to 11, wherein the photo-detector (6) and the strongly scattering object (5) are located relative to each other such that the pixels of the photo-detector (6) are larger than $\eta_{min}\lambda/NA$, where η_{min} is a number between 0 and 2.

13. Optical apparatus according to claim 12, wherein η_{min} is a number between 0 and 1.

14. Optical apparatus according to claim 13, wherein η_{min} is a number in the range 0.05 and 0.5.

15. Optical apparatus according to claim 14, wherein $\eta_{min} = 0.05$.

16. A method of detecting a speckle pattern, comprising irradiating a strongly scattering object (5) with coherent radiation and providing a pixelated photo-detector (6) for receiving the resultant speckle pattern, wherein the size of the pixels of said photo-detector (6) is determined by the location thereof relative to said strongly scattering object (5) and is set at substantially the same size as that of bright and dark patches present in said speckle pattern as determined by λ/NA, where λ is the wavelength of said coherent radiation, and NA is the numerical aperture of said optical system.